

FROM THE ASH — Sandia researcher Guangping Xu puts coal ash into a citric acid mixture, to be fed into a reactor under supercritical CO2 conditions (about 70 times atmospheric pressure) to extract rare-earth metals.

Photo by Rebecca Gustaf

“I’m melting, melting” — coal waste diminished by harmless citric acid

Sandia patent frees rare-earth metals from coal ash for phones, computers

By **Neal Singer**

In one of nature’s unexpected bounties, a harmless food-grade solvent has been used to extract highly sought rare-earth metals from coal ash, reducing the amount of ash without damaging the environment and at the same time increasing an important national resource.

Coal ash is the unwanted but widely present residue of coal-fired power. Rare-earth metals are used for a variety of

high-tech equipment from smart phones to submarines. The separation method, which uses carbon dioxide, water and food-grade citric acid, is the subject of a Sandia patent application.

“This technique not only recovers rare-earth metals in an environmentally harmless manner but would actually improve environments by reducing the toxicity of coal waste dotting America,” said Guangping Xu, lead Sandia researcher on the project.

— CONTINUED ON PAGE 6

This device could usher in GPS-free navigation

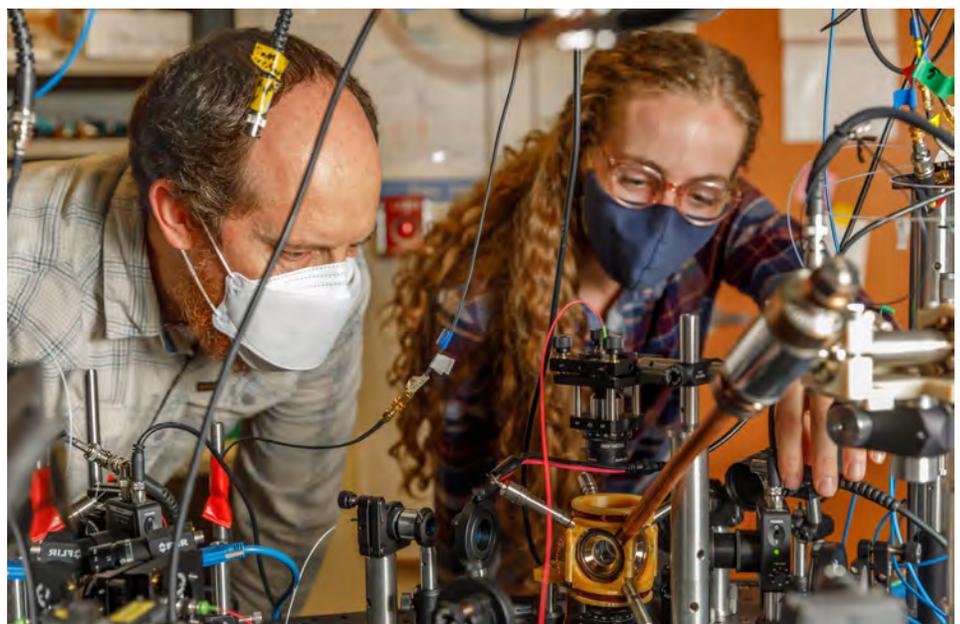
Sandia shows advanced wayfinding tech could finally become compact, fieldable

By **Troy Rumler**

Don’t let the titanium metal walls or the sapphire windows fool you. It’s what’s on the inside of this small, curious device that could someday kick off a new era of navigation.

For over a year, the avocado-sized vacuum chamber has contained a cloud of atoms at the right conditions for precise navigational measurements. It is the first

— CONTINUED ON PAGE 5



PASSIVE PACKAGE — Sandia scientist Peter Schwindt, left, and postdoctoral scientist Bethany Little examine the vacuum package held in a yellow, 3D-printed mount.

Photo by Bret Latter

Managed by NTESS LLC for the National Nuclear Security Administration

Sandia National Laboratories

Albuquerque, New Mexico 87185-1468

Livermore, California 94550-0969

Tonopah, Nevada | Nevada National Security Site

Amarillo, Texas | Carlsbad, New Mexico | Washington, D.C.

Katherine Beherec, Editor kgbeher@sandia.gov
Taylor Henry, Production tahenr@sandia.gov
Randy Montoya, Photographer 505-844-5605
Paul Rhien, California Site Contact prhien@sandia.gov

CONTRIBUTORS

Michelle Fleming (milepost photos, 505-844-4902),
 Neal Singer (505-846-7078), Stephanie Holinka (505-284-9227),
 Kristen Meub (505-845-7215), Michael Baker (505-284-1085),
 Troy Rummel (505-284-1056), Manette Fisher (505-844-1742),
 Valerie Alba (505-284-7879), Luke Frank (505-844-2020),
 Michael Langley (925-294-1482), Meagan Brace (505-844-0499),
 Mollie Rappe (505-844-8220), Darrick Hurst (505-844-8009),
 Jim Danneskiold, Manager (jddanne@sandia.gov)

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Published on alternate Fridays by Internal, Digital and Executive Communications, MS 1468

LAB NEWS ONLINE: sandia.gov/LabNews

TABLE of CONTENTS

- 1 | Coal waste diminished by harmless citric acid *continued on page 6*
- 1 | This device could usher in GPS-free navigation *continued on page 5*
- 2 | NNSA leader Jill Hruby visits Sandia
- 3 | Sandia scientists provide technical assistance to American-Made Solar Prize finalist
- 4 | Safety matters at Sandia Labs
- 7 | Sandia upgrades its benefit options
- 8 | Mileposts
- 9 | Abilities Champions of New Mexico volunteer at Mandy's Farm
- 10 | Women @ Energy features Yuliya Preger
- 12 | Celebrating Hispanic Heritage Month with cars, history and biscochitos

LABNEWS Notes

Lab News may contain photos shot prior to current COVID-19 policies. Individuals in photos followed all social distancing and masking guidelines that were in place when photos were taken.

EDITOR'S NOTE: We've stopped printing the *Lab News*, but will continue to publish every two weeks. We want you to remain in our community of readers, so please send your comments and suggestions for stories or for improving the paper. *Lab News* welcomes guest columnists who wish to tell their own "Sandia story" or offer their observations on life at the Labs or on science and technology in the news. If you have a column (500-800 words) or an idea to submit, contact *Lab News* editor Katherine Beherec at kgbeher@sandia.gov.

NNSA leader Jill Hruby visits Sandia



UP TO SPEED — NNSA Administrator and DOE Under Secretary for Nuclear Security Jill Hruby, right, met with Labs Director James Peery, center, and Michael Duvall, deputy manager of the DOE/NNSA Sandia Field Office, during a visit to on Oct. 7. Sandia leadership provided program overviews, briefings and tours to inform Hruby of key changes and updates at the Labs that are critical to her new role.

Photo by Bret Latter

Sandia scientists provide technical assistance to American-Made Solar Prize finalist

Rocking Solar aims to solarize commercial rooftops across the US

Story by **Kelly Sullivan**

Photos by **Bret Latter**

Sandia researchers recently hosted **Rocking Solar** CEO Darin Palmer to understand his company's approach for populating commercial rooftops with solar as part of the **American-Made Solar Prize** competition. The two-day visit offered Sandia solar scientists and structural engineers a close look at the new system and chance to share their capabilities and expertise with an American-Made Solar Prize participant.

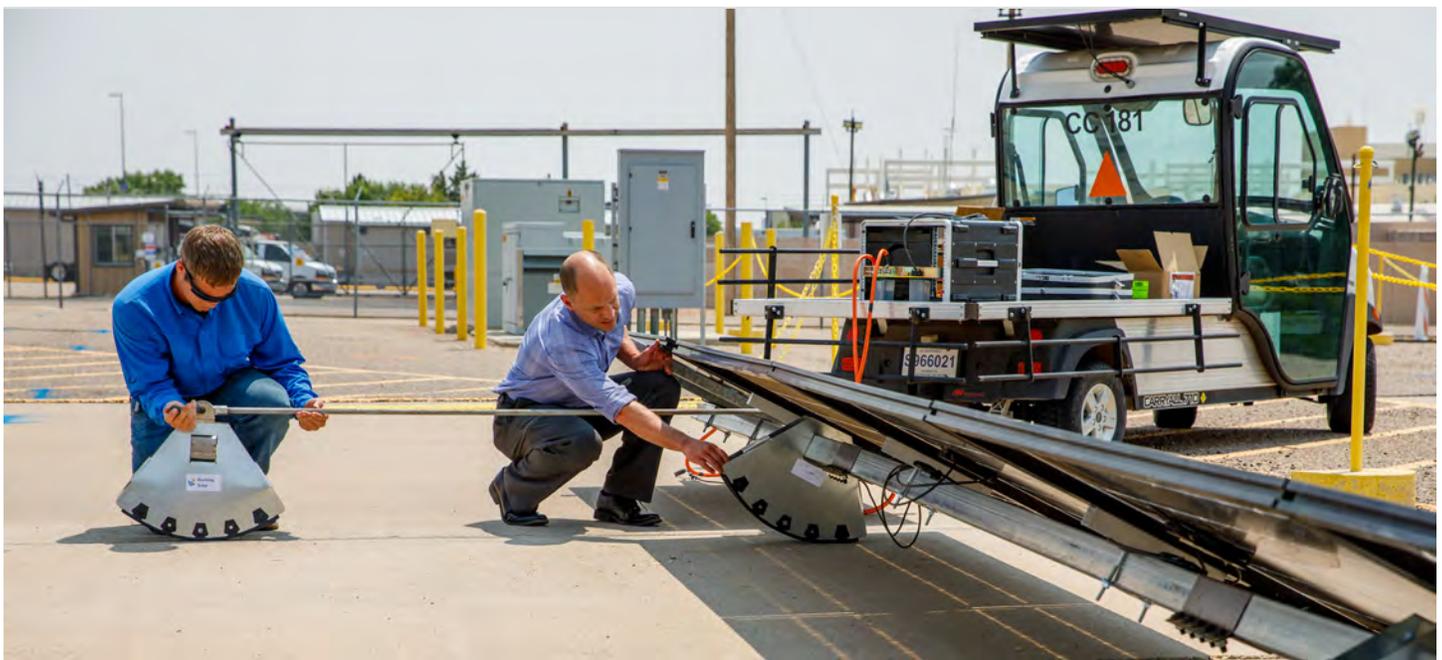
"Sandia continues to support innovation in the U.S. sector in lockstep with the Solar Energy Technologies Office's goal of driving down the costs of solar-generated electricity through improvements in efficiency and reliability," said researcher Laurie Burnham. "To that end, we are working with companies through the American-Made Solar Prize to support innovative concepts and experimental designs that have the potential to reduce costs and open new markets in the U.S. solar sector."



ROCKING INNOVATION — Rocking Solar CEO Darin Palmer holds the rocking mechanism for his patent-pending single-axis tracking design.

The American-Made Solar Prize competition is funded by the DOE **Solar Energy Technologies Office** and is designed to boost U.S. solar manufacturing through a series of contests and by developing a diverse and powerful support network, including national laboratories, energy incubators and other resources across the country.

— CONTINUED ON PAGE 11



GAME-CHANGING DESIGN — Sandia technologist William Snyder and Rocking Solar CEO Darin Palmer adjust the actuator that moves the tracker rockers.

Safety matters at Sandia Labs

National Safety Council honors Cynthia Rivera

By **Luke Frank**

Sandia's Cynthia Rivera has been named a Rising Star of Safety, Class of 2021, by the National Safety Council.

Cynthia joined Labs' mission services as an Environment, Safety & Health coordinator in 2014. Since, she has guided the development of safety training sessions and materials, ergonomics programs, occurrence reporting tools and policy assessments.

"It's great to be recognized," Cynthia said. "But at the end of the day I do it because I care about people and want to be a good partner in promoting safety for Sandia's mission and activities."

"The inquisitive nature of our employees helps to create an important safety culture here," she said. "I really like that. That's why all of these amazing accomplishments come out of this organization."

Cynthia is one of 38 National Safety Council honorees under age 40 with a proven track record of workplace safety leadership and dedication to continuous improvement.

Cynthia's work in Sandia's industrial ergonomics awareness and assessment program has resulted in a 70% reduction in injuries related to industrial ergonomics and overexertion across the Labs. She also developed the Safe Work Methods annual training program for Logistics Operations to focus on safe practices and behaviors. Cynthia crafted the training session and materials, established an annual assessment process for employees and conducted quarterly safe practice sessions based on her analysis of leading and lagging indicators. To date, the program has reduced injuries by 34% and employee participation has increased by 87%.

"Safety is so important because it's an element in everything we do here at Sandia and at home, too," Cynthia said. "Be mindful in the moment. The ultimate goal when developing a safety culture is when people don't even realize that they're implementing safety measures; they're just doing it."

Searching for her calling

With encouragement from her dad, Cynthia began plotting her academic and professional path toward computer science while attending Pojoaque High School. She enrolled in college courses to get a taste for computer science.

"I started my freshman year at UNM taking (computer science) coding classes and I realized after that first semester that this is not for me," she said. "I could do coding – I got it – but it was just not me."

Cynthia sat one night with the entire course catalogue and highlighted all the classes she already had taken. "I was determined to find my calling, but didn't want to lose the time, money or effort I had already expended," she said. "I thought it would help me narrow down what I wanted to be. And it came down to nursing or environmental science."

Cynthia researched both fields intensively to reassure her father that changing her major was a good idea but also to reassure herself that she was making a good choice. "I had done so much research and had a great talk with my dad," she said. "He respected and supported my decision, so I enrolled in a new environmental science program at Northern New Mexico College while interning at Los Alamos National Laboratory where I was mentored by two industrial hygienists."

Cynthia earned a bachelor's in environmental sciences from Northern New Mexico College and went on to earn a master's in industrial hygiene from the University of Montana. In 2014 she joined Sandia's Environment, Safety & Health Planning Department and is now an acting integration manager for the department. "I feel fortunate that I found my path," she said.

Rising Stars award winners align with the National Safety Council awards values and are dedicated to the mission of the National Safety Council: eliminating the leading causes of preventable death so people can live their fullest lives.

Since 2010, the National Safety Council, through the Rising Stars of Safety Award,

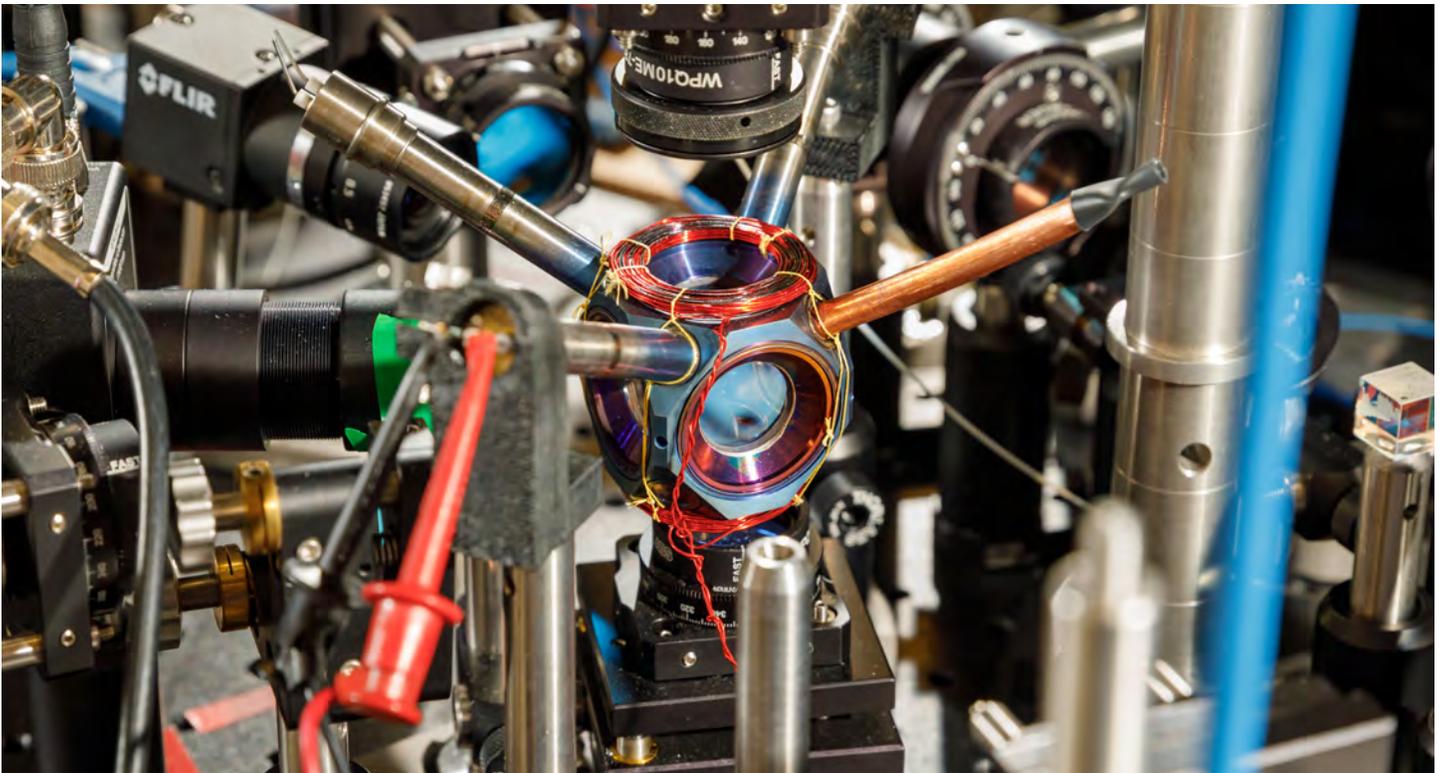


SAFETY MAVEN — Cynthia Rivera is one of 38 National Safety Council's honorees under age 40 with a proven track record of workplace safety leadership and dedication to continuous improvement. **Photo by Bret Latter**

has honored the next generation of professionals under 40 who provide leadership in their organization and are dedicated to continuous safety improvements.

"It's no secret that we find ourselves in a challenging moment for workplace safety. But with leaders like this year's class of Rising Star honorees innovating new safety solutions every day, the future of safety and health is bright," said Lorraine Martin, president and CEO of the National Safety Council. "The contributions of these 'stars' to the NSC mission to keep people safe from the workplace to anyplace are truly stellar."

The National Safety Council's 2021 Rising Stars of Safety are featured in the October edition of [Safety+Health magazine](#).



NEXT-GEN NAVIGATION — A compact device designed and built at Sandia could become a pivotal component of next-generation navigation systems.

Photo by Bret Latter

GPS-free navigation

CONTINUED FROM PAGE 1

device that is small, energy-efficient and reliable enough to potentially move quantum sensors — sensors that use quantum mechanics to outperform conventional technologies — from the lab into commercial use, said Sandia scientist Peter Schwindt.

Sandia developed the chamber as a core technology for future navigation systems that don't rely on GPS satellites, Peter said. It was described earlier this year in the journal [AVS Quantum Science](#).

Countless devices around the world use GPS for wayfinding. It's possible because atomic clocks, which are known for extremely accurate timekeeping, hold the network of satellites perfectly in sync.

But GPS signals can be jammed or spoofed, potentially disabling navigation systems on commercial and military vehicles alike, Peter said.

So instead of relying on satellites, Peter said future vehicles might keep track of their own position. They could do that with on-board devices as accurate as atomic clocks, but that measure acceleration and rotation by shining lasers into

small clouds of rubidium gas like the one Sandia has contained.

Compactness key to real-world applications

Atomic accelerometers and gyroscopes already exist, but they're too bulky and power-hungry to use in an airplane's navigation system. That's because they need a large vacuum system to work, one that needs thousands of volts of electricity.

"Quantum sensors are a growing field, and there are lots of applications you can demonstrate in the lab," said Sandia post-doctoral scientist Bethany Little, who is contributing to the research. "But when you move it into the real world there are lots of problems you have to solve. Two are making the sensor compact and rugged. The physics takes place all in a cubic centimeter (0.6 cubic inches) of volume, so anything larger than that is wasted space."

Bethany said her team has shown that quantum sensing can work without a high-powered vacuum system. This shrinks the package to a practical size without sacrificing reliability.

Instead of a powered vacuum pump, which whisks away molecules that leak in

and wreck measurements, a pair of devices called getters use chemical reactions to bind intruders. The getters are each about the size of a pencil eraser so they can be tucked inside two narrow tubes sticking out of the titanium package. They also work without a power source.

To further keep out contaminants, Peter partnered with Sandia materials scientists to build the chamber out of titanium and sapphire. These materials are especially good at blocking out gasses like helium, which can squeeze through stainless steel and Pyrex glass. Funding was provided by Sandia's [Laboratory Directed Research and Development](#) program.

Construction took sophisticated fabrication techniques that Sandia has honed to bond advanced materials for nuclear weapons components. And like a nuclear weapon, the titanium chamber must work reliably for years.

The Sandia team is continuing to monitor the device. Their goal is to keep it sealed and operational for five years, an important milestone toward showing the technology is ready to be fielded. In the meantime, they're exploring ways to streamline manufacturing. 

Rare-earth metals

CONTINUED FROM PAGE 1

“Harmless extraction of rare-earth metals from coal ash not only provides a national source of materials essential for computer chips, smart phones and other high-tech products — including fighter jets and submarines — but also make the coal ash cleaner and less toxic, enabling its direct reuse as concrete filler or agricultural topsoil.”

The method, if widely adopted, could make coal ash, currently an environmental pariah, into a commercially viable product, Guangping said.

Environmentally friendly method for mining rare-earth metals

The most common acids used as chemical separators in mining — nitric, sulfuric or phosphonic acids — also are able to extract rare-earth metals from coal ash but produce large amounts of acid waste, leaving the environment in worse shape than before.

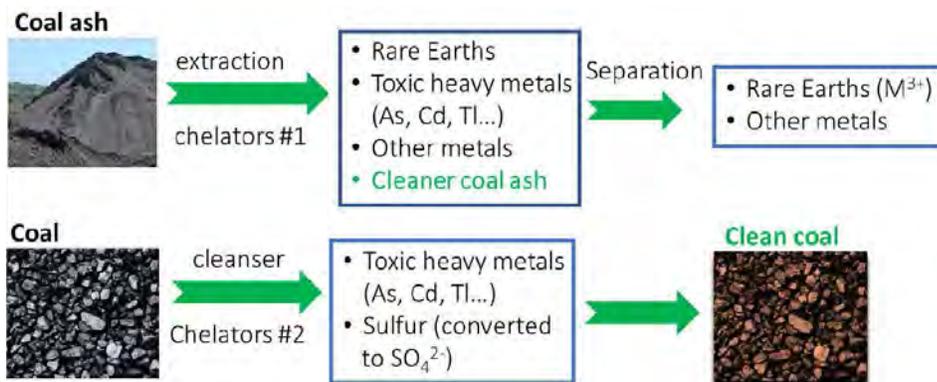
“Environmentally harmful acids would raise cleanup costs beyond economic feasibility in the United States,” Guangping said.

The Sandia process, which uses citric acid as a carrier for rare-earth metals so they separate from coal ash, the host material, was implemented by Guangping. The extraction process is facilitated by using supercritical carbon dioxide solvent. Guangping’s Sandia colleague Yongliang Xiong suggested citric acid, a commonly used and environmentally friendly chemical for holding metals in solution.

Guangping found that in less than a day, at 70 degrees C (158 degrees F) and 1,100 pounds per square inch pressure (about 70 times ordinary atmospheric pressure), the method extracted 42% of rare-earth metals present in coal waste samples.

Chinese mines, where 95% of the world’s resources of rare-earth metals are located, achieve less efficient separation while using environmentally damaging methods.

“Theoretically, an American company could use this technique to mine coal and coal byproducts for rare-earth metals and compete with Chinese mining,”



COAL CLEANSER — Sandia technology can be used in extracting rare-earth elements and other critical metals from coal ash. It can also be used as a coal cleanser to remove the toxic materials and sulfur.

Graphic by Guangping Xu

said Guangping. Furthermore, for U.S. national security purposes “it is probably reasonable to have alternate sources of rare-earth metals to avoid being at the mercy of a foreign supply.”

Detoxifying coal ash for reuse alone should be worth the effort, he said. There’s no shortage of coal ash as a raw material. According to a paper published as late as 2016 in

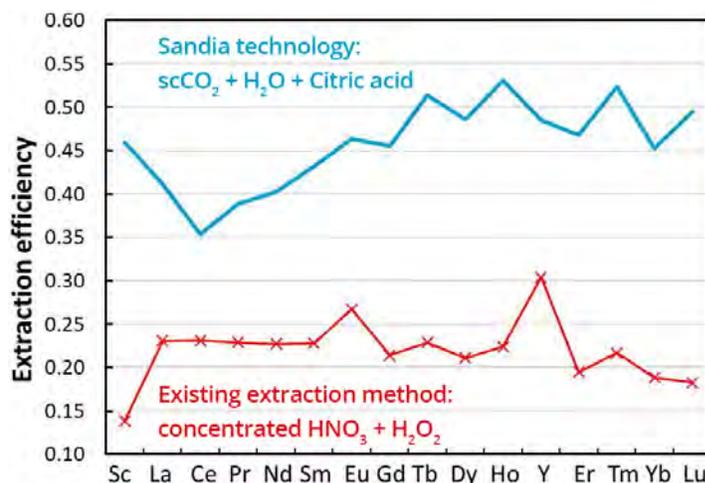
the journal **Environmental Science and Technology**, “Approximately 115 million metric tons of coal combustion products are generated annually, and this sum includes 45 million tons of fly ash.”

These numbers remain of interest today, said Guangping.

“If we don’t detoxify and reuse the coal ash, then it will be abandoned in place and cost billions of dollars to clean up over the long term,” he said. To help make that outcome less likely, “we expect tests of our extraction techniques at larger volumes and on a variety of coal-based sources in the near future.”

Carbon sequestration also a possibility

This technology also could open a new avenue for carbon-dioxide reutilization



BETTER EXTRACTION — Comparison of extraction efficiency between Sandia’s environmentally benign technology and existing method using strong acids, concentrated nitric acid and hydrogen peroxide. Graphic by Guangping Xu

and sequestration, said Guangping’s Sandia colleague Mark Rigali, who with Guangping is exploring the use of citric acid and supercritical carbon dioxide to mine metals from oil and gas shales that are often rich in metals.

“Using existing oil and gas fracking wells, the citric acid and supercritical carbon dioxide can be used cost-effectively to mine metals while disposing of carbon dioxide below ground,” Mark said.

Subsurface storage of the carbon dioxide should keep it from entering the atmosphere and contributing to climate change.

The work is supported by Sandia’s **Laboratory Directed Research and Development** office.

Sandia upgrades its benefit options

Employees encouraged to take action during open enrollment

By **Shelley Kleinschmidt**

Sandia has heard employee feedback and continues to improve benefits through new options and enhancements. This year, the biggest news during Sandia's Open Enrollment period, Oct. 25 to Nov. 12, is the announcement of the Health Savings Plan, a new medical plan, and the health savings account paired with it. Employees are encouraged to explore this option and learn about the other benefits available for 2022.

This year, all benefits-eligible employees must confirm their medical plan choice for 2022.

Vacation sell program

In addition to the popular vacation buy program, which enables employees to buy additional vacation during Open Enrollment, Sandia is introducing a new vacation sell program this year.

The vacation sell program will allow nonrepresented employees to cash in 40 hours of future vacation time, or 20 hours for part-time employees, from calendar year 2022. In exchange, they will receive a lump-sum payment in May. Vacation hours sold will be based on the employee's rate at the time of payout and taxed as ordinary income.

Vacation buy and vacation sell elections are only available during Open Enrollment for the following year. Employees can elect to buy or sell vacation, but they cannot choose both. This election cannot be changed after Open Enrollment, even in the case of a qualifying life event.

Family care and support services

Caregivers carry a lot on their shoulders. To help ease that stress, Sandia offers new benefits to nonrepresented employees to support them in their caregiving journey,

with access to services that help find:

- Childcare support before, during and after work, including full-time or live-in options.
- Academic support and recommendations for virtual activities and local programs.
- Eldercare assistance, including finding in-home care or a care facility, setting up home modifications, meal delivery, transportation, health advocacy and socialization programs.
- Back-up care available all year and at all hours for when primary care unexpectedly falls through.
- Special needs support, including advocacy, school decisions, care transitions, aides and therapists and navigating state- and employer-sponsored benefits.
- Health condition and mental health management for ongoing conditions and behavioral health issues.

Employees will be able to access these new benefits in 2022, and Sandia will share more details soon. In the meantime, employees always who need assistance with family concerns can reach out to Sandia's [employee assistance program](#) or contact their [medical plan's employee assistance program](#).



Additional Open Enrollment resources

[2022 Plans and Open Enrollment](#) — Visit the Open Enrollment landing page to get started.

[Medical Plan Decision Guide](#) — Learn about and compare the medical plans.

[Interactive health plan decision tool](#) — Answer a few questions and see the recommended plan for you.

[Health Savings Plan video introduction](#) — Watch a 30-minute explanation of the ins and outs of plan coverage and the health savings account.

[2022 Open Enrollment Newsletter](#) — See all that's new for 2022, all in one place.

[2022 Premium chart](#) — Review the 2022 medical and prescription drug, dental and vision plan premiums.

Hospital indemnity insurance benefit

Both Sandia medical plans cover hospital admissions, but even with health insurance coverage, hospitalization can be a significant financial burden.

Sandia is introducing a new voluntary insurance benefit for 2022: hospital indemnity insurance. Employees who elect this insurance will receive a direct cash payment from MetLife to cover expenses from a planned or unplanned hospital visit. The cash can be used toward any type of expense, such as the employee share of the deductible and coinsurance, a dog-sitter fee during time in the hospital or a hotel stay for family during an employee's surgery.

This new benefit is offered through [Sandia Extras](#), and staff can sign up at [mysandiaextras.com](#).

Easy to act and enroll

With all the new benefits to consider, employees need to take action during Open Enrollment.

Sandians are invited to compare the medical plans and decide whether to try the new Health Savings Plan and consider whether to buy or sell vacation for 2022. Represented employees should review their respective Collective Bargaining Agreement to confirm benefits.

Open Enrollment is the time to enroll, disenroll or make changes to **Sandia Extras** voluntary benefits, including the new hospital indemnity insurance benefit, accident, critical illness insurance, disability benefits or legal services. During Open Enrollment, employees can also take advantage of a special opportunity to enroll in or increase their voluntary life insurance coverage through **MetLife**.

Enroll through **HR Self Service** from Oct. 25 to Nov. 12 by 5 p.m. MST.

News for PreMedicare retirees

Aside from the premiums, there are very few changes to Sandia Total Health, PreMedicare retirees' current plan.

PreMedicare retirees also have a new plan option: the High Deductible Health Plan. Retirees can choose a plan administered by Blue Cross and Blue Shield of New Mexico or UnitedHealthcare. The new plan offers 100% coverage for in-network preventive services; enhanced prescription drug coverage for generic preventive medications; a higher deductible, but lower premium costs; combined medical and prescription drug annual deductible; the same coinsurance existing with Sandia Total Health, after meeting the combined annual deductible; and only one out-of-pocket limit for medical services and prescription drugs.

It is important to note that, to comply with IRS rules, Sandia cannot offer a health reimbursement account or a health savings account with the new High Deductible

Health Plan. By switching to the High Deductible Health Plan, any balance in that retiree's health reimbursement account will be forfeited at the end of 2021.

Enrollment for PreMedicare retirees runs until Nov. 12 for coverage beginning on Jan. 1, 2022.

All these details and more are provided in the enrollment guide mailed to retirees at home and at sandiafirebenefits.com.

News for Medicare retirees

Sandia Medicare retirees are eligible to shop for supplemental Medicare plans, including individual Medicare Advantage plans, through Via Benefits. Speak with a Via Benefits licensed benefit advisor at 888-598-7809 or at my.viabenefits.com/sandia to shop, compare and enroll online.

Enrollment for Medicare retirees runs until Dec. 7 for coverage beginning on Jan. 1, 2022.

All the details are provided in the enrollment guide mailed to retirees at home, and found at my.viabenefits.com/sandia. 

KEEP UP WITH THE LABS
anytime, anywhere

SIGN UP
to get Lab News
in your Inbox
every two weeks

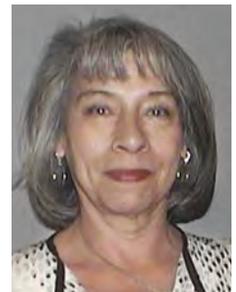
sandia.gov/LabNews

Mileposts



Todd Culp

30



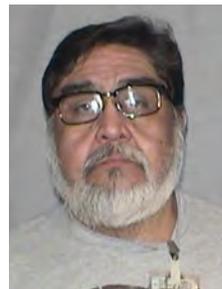
Benita Montañó

30



David Noble

25



Mark Duran

20



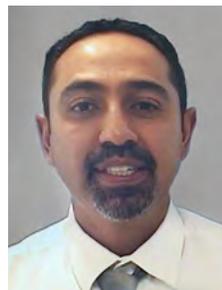
Dominic Perea

20



Tom Rice

20



Ed Romero

20



Jennifer Byers

15



Lonnie Haden

15



Pat Mullen

15



HELPING HANDS — A group of Sandians from the Abilities Champions of New Mexico and Community Involvement spent the day at Mandy’s Farm.

Abilities Champions of New Mexico volunteer at Mandy’s Farm

Photos by **Jennifer Gaydos**

This summer, Abilities Champions of New Mexico partnered with Community Involvement to volunteer at **Mandy’s Farm**. The groups assisted with daily tasks like landscaping, animal care, gardening, organization and barn work. Mandy’s Farm helps individuals with developmental disabilities achieve their goals by facilitating an environment for them to learn and work. 



FARM DAYS — Sandian volunteers enjoyed hanging out with and caring for alpacas and goats at the farm.



PACK LEADER — A goat leads Sandia volunteers to their work at Mandy’s Farm, an organization that offers residential services, educational and therapeutic day services and employment to individuals with developmental disabilities.

WE

DO GREAT THINGS

TOGETHER

» OCTOBER 4 - 22 ‹

Sandians gave \$4.8 million in 2020 to help others.

Every dollar matters.
Please contribute.

give.sandia.gov



SANDIA GIVES 



Women @ Energy features Yuliya Preger

Sandia chemical engineer recognized by DOE STEM Rising site

By **Sarah Jewel Johnson**

Sandia chemical engineer Yuliya Preger has been recognized by DOE's **Women @ Energy: STEM Rising** website, which honors women in STEM fields throughout the DOE complex.

Yuliya Preger works on energy storage technology as a senior research and development chemical engineer. Since joining Sandia in 2018, she has led research in **lithium-ion battery safety and reliability**, including long-term cycling of commercial batteries to understand what conditions enhance degradation and abuse testing to understand how battery aging influences safety. Yuliya also partners with power electronics engineers to develop better ways of managing batteries, including a patent-pending method for mitigating thermal runaway, and with power systems engineers to incorporate battery data into techno-economic analysis of energy storage.

Yuliya is passionate about open sourcing battery data and **software tools** to aid energy storage analysis and cut down the development time for new technologies. One outcome of this interest is **batteryarchive.org**, the first public repository for easy visualization and comparison of battery degradation data across institutions. In the few months since launch, the site has been used by individuals across academia, industry and utilities to understand how lithium-ion batteries perform in different conditions and to save money in their own testing. Yuliya has a doctorate in chemical engineering from the University of Wisconsin-Madison and a bachelor's from the Massachusetts Institute of Technology.

Yuliya was recently interviewed for her feature spot on the DOE Women @ Energy website.

Q What inspired you to work in STEM?

A I was originally unsure of what career I wanted to pursue. On a whim, I joined my high school's FIRST robotics team, and after three years, I decided that



BATTERY DEGRADATION — Yuliya Preger tests batteries in her lab to understand how their performance degrades under different conditions. Yuliya was recognized by DOE's **Women @ Energy: STEM Rising** website. **Photo by Bret Latter**

engineering was the path for me. I became a chemical engineer rather than a mechanical or electrical engineer, but I still credit that team and our coach with getting me to where I am today.

Q What excites you about your work at Sandia?

A Batteries and the electric grid power nearly all of modern life: charging phones, keeping lights on, treating water and so much more. When it's working well, we don't have to think about it. But when the grid fails, there are dire consequences.

Since the electric grid powers so much of modern society, it's meaningful work to me to make it more reliable. At Sandia, I appreciate the opportunity to do basic research while still working with external stakeholders to translate our findings into meaningful suggestions for them. Individuals at utilities, insurance companies, standards organizations and other entities need to make important decisions about batteries, but they have questions like: Are particular batteries safer than others? Is there any data out there on Li-ion battery failure modes and

rates in energy storage systems? Is there data to show correlation between battery life and depth of discharge? It's a privilege to both discover and feel like those discoveries translate to real-world problems.

I also enjoy working on multidisciplinary teams and learning from my brilliant colleagues. So much intellectual magic happens when researchers from different fields come together. For example, I am a chemical engineer focusing on batteries for grid energy storage, but I share an office with an electrical engineer focusing on power electronics. Typically, power electronic engineers treat batteries as a black box and the same for battery people with power electronics. But through collaboration, we have identified issues with integrating batteries and power electronics that neither of our individual fields has considered in great detail.

Q How can our country engage more women, girls and other underrepresented groups in STEM?

A In my experience, I think two key things are: 1) increasing representation of

women and underrepresented groups in science (“if you can see it, you can be it”); and 2) creating more awareness about the opportunities for different skill sets and problems people can work on.

It’s impossible to explore a career path or investigate research questions if you are not even aware of what career paths or opportunities exist. For example, many people are not aware that you can actually get paid a livable stipend with free tuition to pursue a PhD in STEM. My FIRST robotics team and coach in high school made me aware of many of these opportunities, but not everyone has that sort of experience.

K-12 STEM outreach is critical to reach and connect to underrepresented minorities and women. Since undergrad, I’ve been involved in designing and implementing hands-on activities to get children involved in science, including organizing lab visits and research presentations to understand what a scientist or engineer does day-to-day. As engineers, we solve problems. By implementing hands-on demonstrations of how

to design a better roller coaster, pharmaceutical formulation system or even shoes, we can show how fun engineering is and evoke the natural curiosity and inquisitiveness that young people have.

Q Do you have tips you’d recommend for someone looking to enter your field of work?

A Prior to entering any field, I think it is helpful to speak with people in that field to understand what the day-to-day work looks like. When I chose to major in chemical engineering, I assumed it would be a straightforward combination of chemistry and engineering. In reality, there was a greater emphasis on math and physics. Luckily, it all worked out.

To enter the field of energy and batteries specifically, I think a generally useful thing is to have a mix of hands-on and theoretical training — to be someone who can implement things that work but also understand how math says that they should work. This helps identify peculiarities of

operation that lead to device improvements. Additionally, batteries/energy storage is a very broad field that extends into many sectors — for example, national labs, industry (including materials, manufacturing, products, etc.) and policy. It is worthwhile to consider what sector is the best place for the types of problems you are interested in working on.

Battery University is a great starting point. It’s a free website that teaches fundamentals about how batteries work and offers an in-depth introduction into the field.

Q When you have free time, what are your hobbies?

A My husband and I spend a fair bit of time outdoors — hiking or working on the garden.

I previously operated a “Daily Plant Fact” mailing list, sending out one plant fact a day for a full year, and have recently switched over to a “Daily Invention Fact” theme. It’s been a big hit with family, friends and colleagues. 

Rocking Solar

CONTINUED FROM PAGE 3

“The American-Made Solar Prize has given us a significant jumpstart in our development and commercialization efforts,” Palmer said. “Sandia testing was critical to ensure Rocking Solar design meets commercial rooftop requirements of wind uplift, dynamic wind pressures, snow load, seismic and electrical grounding. Thanks to Sandia and others, we are confident we can deliver a best-in-class solution.”

Solar panels that rotate on single-axis trackers follow the sun as its vertical position in the sky changes relative to a fixed surface. They typically increase solar generation from 25% to 35% but at a higher cost than fixed-tilt solar arrays. Unlike fixed-tilt solar arrays, which don’t rotate, trackers require control systems and a heavy-duty support structure that enables solar panels to rotate along an axis, even under heavy wind loads.

According to Palmer, Rocking Solar’s design outcompetes traditional single-axis trackers on commercial rooftops, where weight, flexibility, and cost are priority. The Rocking Solar approach eliminates the need

for heavy-duty motors and relies instead on the momentum of a rocker controlled by a simple actuator. The result is a high-efficiency tracker that weighs less, costs less and is lower risk, which results in less potential for roof damage. If it passes rigorous engineering tests, Palmer hopes to implement the design on thousands of acres of warehouse and other commercial rooftops, bringing electricity generation close to demand.

“Sandia was not there just to test our system but to discuss improvements and considerations for our design. From the technical staff to managers, they were all engaged in making it a great experience for Rocking Solar,” Palmer said.

Like other single-axis tracker designs, Rocking Solar generates up to 30% more energy per panel, relative to fixed-tilt arrays. This offers techno-economic benefits to commercial rooftops, many of which are reflective and ideal for bifacial solar systems that increase yield. With a higher yield, commercial customers would need 30% fewer panels to meet energy output, and they could save up to 22% for the same amount of energy. Additionally, the Rocking Solar design requires less ballast and fewer penetrations relative to traditional tracker

systems, translating into less risk and lower installation costs for site owners.

“Sandia’s support for Rocking Solar is a great example of cross-lab collaboration, involving the PSEL team, as well as Sandia structural engineers,” Laurie said.

“The American-Made Solar Prize opens up Sandia’s capabilities and expertise to help American industry,” said Tony Martino, Photovoltaics & Material Technologies manager. “At the same time, we learn the newest technologies coming to market, and we meet the people. It is a great way to stay engaged in the community and develop partnerships that can last for years.”

Next, Rocking Solar hopes to conduct a demonstration project at the **Nevada Regional Test Center**, with technical support from Sandia and University of Nevada, Las Vegas. The location of the site, just south of Las Vegas, was chosen partially to draw attention from nearby casinos and other owners of commercial rooftops in a top-10 state for cumulative solar capacity.

The American-Made Solar Prize is directed and administered by the **National Renewable Energy Laboratory** and funded by the **DOE** Solar Energy Technologies Office. 

Celebrating Hispanic Heritage Month with cars, history and biscochitos

Photos by **Lonnie Anderson**



SHOWING OFF — On Friday, Oct. 1, a socially distanced annual car show was held at Hardin Field. The winners were: Herman Seijas, first place, 2002 Ford Excursion; Izrael Quintana, second place, 1968 Chevy Camaro; and Brett Ellen, third place, 2019 Acura NSX.





Celebrate Hispanic Heritage Month by baking blue corn biscochitos with this recipe from Montenique Rodriguez.

"I got this recipe from an old coworkers' daughter who loves to experiment in her heritage and make the foods from it. The blue corn gives an earthy flavor. I think it is great for kids to experiment with foods to learn their culture. This is a big hit for Christmas in my house!" Montenique said.



Blue corn biscochitos

INGREDIENTS

Cookies

- 1 lb. shortening (preferably Snow Cap)
- 1 egg
- 1 cup brown sugar
- 1 cup granulated sugar
- 2 cups all-purpose flour
- 2 cups blue corn flour (Masa Brosa brand)
- 1 Tbsp. cinnamon
- Sprinkle of salt
- 1/2 tsp. baking powder
- 2 Tbsp. vanilla extract
- 2 pinches of anise (optional)

Biscochito bath

- 1 cup sugar
- 1 Tbsp. cinnamon

[CLICK HERE](#)
FOR THE PRINTER FRIENDLY RECIPE!

PREPARATION INSTRUCTIONS

1. Preheat oven to 350 degrees
2. In a large bowl, combine shortening and egg with a fork until well mixed.
3. Add brown sugar and combine thoroughly.
4. Add 1 cup of sugar and mix until well combined.
5. Add 1 cup of all-purpose flour and mix well with hands. It will be sticky.
6. Add 2nd cup of all-purpose flour and mix again. Make sure to get all the flour at the bottom.
7. Add 1 cup of blue corn flour and mix well.
8. Add 2nd cup of blue corn flour and mix well. If you feel you need more flour, only add more blue corn flour.
9. Add cinnamon, salt, baking powder, vanilla extract and anise. Combine thoroughly with fork.
10. Lightly flour counter surface and roll out with rolling pin to medium thickness. This takes patience as it may stick to the rolling pin.
11. Use cookie cutter or glass cup and place on foil-lined baking sheets.
12. Bake for 10-12 minutes or until lightly golden.
13. While cookies are baking, mix your biscochito bath until well mixed.
14. While cookies are warm, not hot, roll cookies into bath on both sides and store in desired container.

Dietary considerations: Egg



CELEBRATING HERITAGE — Sandia commemorated Hispanic Heritage Month with a variety of virtual and socially distanced, in-person activities. Events during the month, celebrated Sept. 15 to Oct. 15, included: virtual kick-off hosted by the Hispanic Outreach and Leadership Awareness and Hispanic Leadership Council employee resource groups; "Hispanics at Sandia: A Look at History" livestream; Diversity Cinema showing; STEM art contest featuring creations by local students; and art display by Sandia employees. HOLA partnered with Sandia's inclusion, diversity, EEO & AA organization to publish a [cultural recipe cookbook titled "Delicious!"](#) on the SRN.